

ATTACHMENT D

PLANT MIX ISSUES

When the SM user selects the option for “Plant Mix By Study Area” from the “INTRFACE” tab of the inputs worksheet, SM attempts to use ARMIS data for plant mix. What actually occurs is an averaging, of sorts, between the national defaults and the ARMIS data. The averaging is not based on sound mathematical principles and is not internally consistent; it causes invalid skewing toward aerial that is greater than either of the two separate plant mix scenarios. For example: In Nebraska, the highest density aerial copper feeder percentage is 0% for the national defaults and 70.6% for the calculated Plant Mix By Study Area, while the ARMIS aerial percentage is 2.6%. Clearly, the model’s Plant Mix By Study Area algorithm violates even a cursory reasonableness test, as 70.6% copper feeder is not even technically feasible or desirable in the highest density group.

The “Plant Mix Template.xls” worksheet generates unreasonable results due to several errors:

- Double weighting of model plant mix: To generate new plant mix percentages, the worksheet takes input from three sources: 1. The national default mix, 2. The SM model’s network design from a prior run, and 3. ARMIS data. Since 2 is a direct result of 1, the national default mix is double weighted. There is no need to consider the output of the model in calculating new plant mix figures, as it is illogical and introduces endless iterative logic complications.

- Formulaic errors: The worksheet calculates weightings based on inconsistent data that multiplies inconsistent units of measure. For example: The “ARMIS Buried Ratio” is the ARMIS buried sheath distance divided by the sum of underground and aerial ($\frac{ModelBuried}{ModelUG + ModelAerial}$). The “Model Buried Ratio” is completely different: $\frac{ModelBuried}{ModelUG + ModelBuried + ModelAerial - ArmisUG}$. This function is not a ratio, and the inclusion of ARMIS underground is completely illogical. The resulting “Buried Ratio” is then the ARMIS ratio divided by the Model ratio, creating a mathematically errant and arbitrary number.

The “Underground Ratio” is more simple, but no less illogical. It is the ARMIS sheath miles of underground divided by the Model sheath miles of underground. This introduces two completely incompatible figures. There is no guarantee, or even likelihood, that the overall plant sheath miles are comparable between the model and ARMIS. Comparing absolute numbers, rather than percentages is a mathematical error.

ARMIS ratios for underground, buried, and aerial should be percentages of total sheath miles of all plant types. They should then be averaged with mix percentages from the national default values.

- Incorrect weighting of aerial plant: The worksheet, once it calculates a new underground and buried mix, assumes that aerial is simply what is left to make the

mix sum to 100% (100% minus underground minus buried). This often allows aerial to be higher than both the ARMIS and national default values. The proper solution is to apply factors to all three plant types in an intermediate table. Then create the final table by grossing each plant type up to a sum of 100%. This is done by dividing each intermediate value by the sum of all three intermediate plant type percentages. The final plant mix table will then sum to 100%, and each plant type will be treated equally.

U S WEST provided an improved Plant Mix Template.xls file that addressed the above errors and generates more useful results on May 19, 1999. U S WEST also recommends using the Plant Mix By Study Area =1 setting for all USF purposes. These changes will prevent a bias toward too much aerial plant, which prevent the model from being forward-looking and reasonable in design.

U S WEST is concerned that the plant mix allocation is problematic in the event the plant mix inputs do not sum to 100%. The following current code allocates plant mix based on which structure type is lowest in cost:

```
if u <=min( a, b )  
    then pct_ugd := pct_ugd + free_pct  
else  
if b <=min( u, a )  
    then pct_bur := pct_bur + free_pct  
else  
if a <=min( b, u )  
    then pct_aer := pct_aer + free_pct;
```

In the event a plant type percent is set to zero, the above code may still implement its use. A plant mix input of zero usually indicates that its use is not feasible for a particular density zone. U S WEST recommends that, if a plant mix percent is set to zero, it should be a signal to not use that structure type for that particular density zone. The above code should be modified so that zero percent plant mix inputs are kept at zero after processing.

ATTACHMENT E

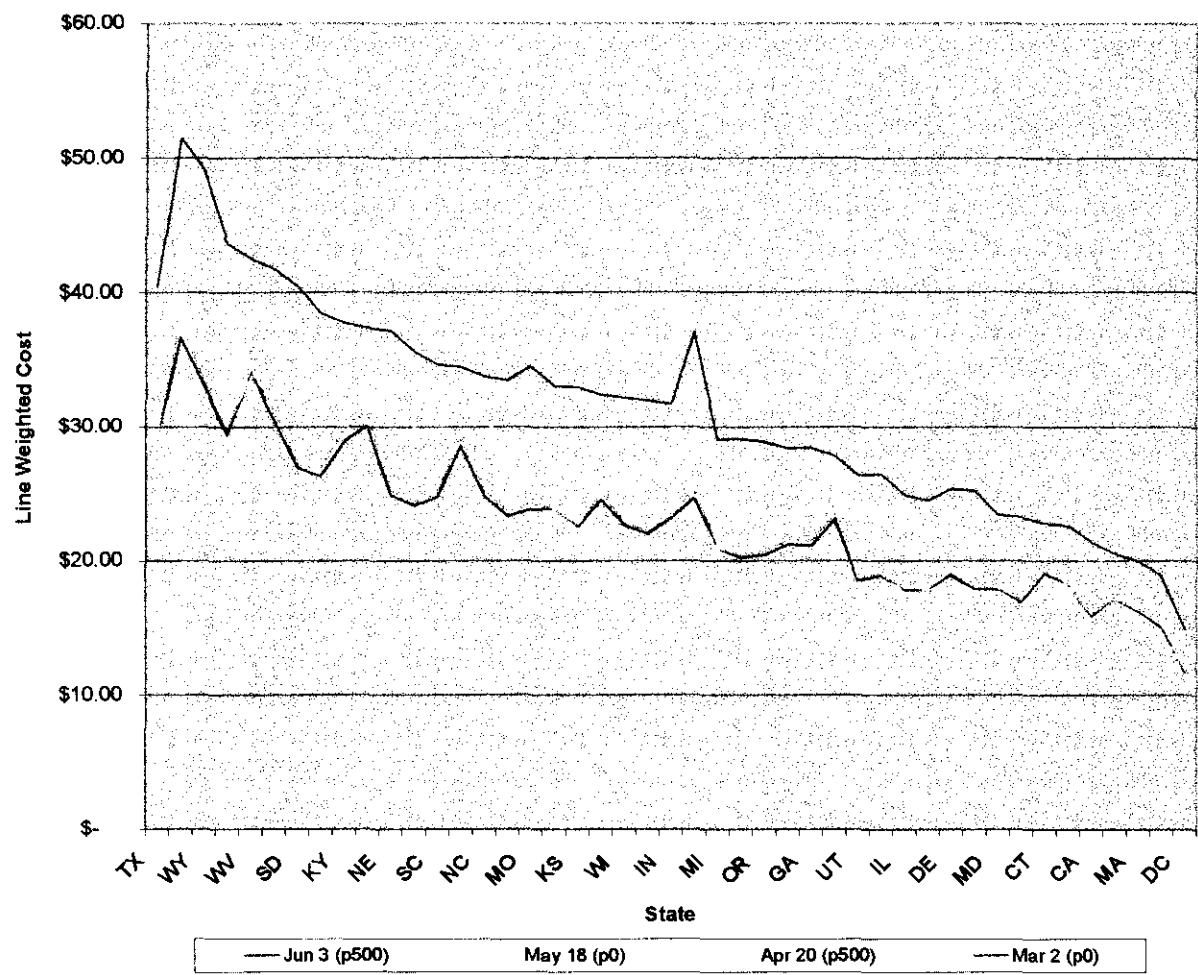
drop_length 0.5
 nid_cost \$ 39.50
 user_lambda 0.5
 drop_cost \$ 560

Row	Cluster	Row	Col	Res Pts	Bus Pts	Total Pts	Lots	EW_Lots	NS_Lots	Total Lots
1	1	2	2	1	25	26	31	4	8	32
2	1	2	3	0	2	2	0	1	1	1
3	1	2	4	11	1	12	11	4	3	12
4	1	2	5	12	4	16	12	4	3	12
5	1	2	6	3	0	3	3	3	1	3
6	1	3	2	0	48	48	56	8	7	56
7	1	3	3	1	1	2	0	1	1	1
8	1	3	4	2	1	3	2	2	1	2
9	1	3	5	13	4	17	13	5	3	15
10	1	3	6	4	0	4	4	2	2	4

Row	Res Lines	Bus Lines	Total Lines	Lines Per Lot	nid cost	calculate d drop length (kf)	drop length (kf)	drop cost
1	1	2,750	2,751	85.97	\$1,264.00	0.0364	0.0364	\$ 652
2	-	4	4	4.00	\$ 39.50	0.2173	0.2173	\$ 122
3	11	1	12	1.00	\$ 474.00	0.0675	0.0675	\$ 454
4	12	4	16	1.33	\$ 474.00	0.0675	0.0675	\$ 454
5	3	-	3	1.00	\$ 118.50	0.1849	0.1849	\$ 311
6	-	5,174	5,174	92.39	\$2,212.00	0.0299	0.0299	\$ 939
7	-	1	1	1.00	\$ 39.50	0.2173	0.2173	\$ 122
8	2	1	3	1.50	\$ 79.00	0.1906	0.1906	\$ 213
9	13	4	17	1.13	\$ 592.50	0.0650	0.0650	\$ 546
10	4	-	4	1.00	\$ 158.00	0.1086	0.1086	\$ 243

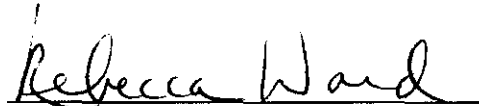
ATTACHMENT F

HCPM Results



CERTIFICATE OF SERVICE

I, Rebecca Ward, do hereby certify that on the 23rd day of July, 1999, I have caused a copy of the foregoing **COMMENTS OF U S WEST, INC.** to be served, via hand delivery, upon the persons listed on the attached service list.


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